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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/531,423	04/15/2005	Ryou Obara	OBARA7	9086

1444 7590 11/29/2005

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WASHINGTON, DC 20001-5303

EXAMINER
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SAVAGE, JASON L

ART UNIT	PAPER NUMBER
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1775

DATE MAILED: 11/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/531,423

Applicant(s)

OBARA ET AL.

Examiner

Jason L. Savage

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 18-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 18-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 20050415.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 18-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harada et al (JP 2000-345314 English Machine Translation) in view of Herbst-Dederichs (PGPB 2004/0069141).

Harada teaches a sprayed coating comprising chromium carbide particles, a matrix metal of Ni which has a porosity of less than 1.2% and a hardness of greater than or equal to 1000 Hv (abs.). Harada is silent to the objects being coated as well as the particle size and pore diameter; however it does teach that the member which is coated has desirable properties of hardness and wear resistance.

Herbst-Dederichs teaches high-speed flame spraying of a chromium carbide containing powder mixture to form an abrasion and wear resistant protective coating on a piston ring (par[0001-0002]). Herbst-Dederichs further teaches that the coating comprises chromium carbide particles having a particle size of less than 3  $\mu\text{m}$  and a metal matrix of Ni-Cr alloy (par[0006]). Herbst-Dederichs further teaches that by limiting the size of the carbide particles to less than 3  $\mu\text{m}$ , the carbide outbreak is lowered, the risk of cracking is minimized and internal stresses in the carbide are reduced (par[0007]).

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It would have been obvious to one of ordinary skill in the art at the time of the invention to have applied the teachings of Herbst-Dederichs to the spray coated member of Harada wherein the carbide particle size is limited to less than 3  $\mu\text{m}$  in order to reduce the risk of cracking and lower the internal stresses in the protective coating. Furthermore, it would have been obvious to one of ordinary skill in the art that the coating of Harada could be suitably employed as a protective coating for a piston ring such as was described by Herbst-Dederichs with a reasonable expectation of success.

Regarding the limitation that the coated piston is combined with a cylinder liner of cast iron, the use of cast iron cylinder liners in conjunction with piston rings are known in the art. It would have been obvious to have selected a liner composed of a conventional material to use with the piston ring of Harada as modified by Herbst-Dederichs.

Regarding the limitation that the tensile strength of the liner be less than 300 Mpa, it would have been obvious to one of ordinary skill in the art at the time of the invention have selected any conventional cylinder liner material including cast iron liners. Absent a teaching of the criticality or showing of unexpected results from the tensile strength of the liner being within the claimed range, it would not provide a patentable distinction over the prior art since most conventional cast iron material have strengths within the claimed range.

Regarding the limitation that the average pore diameter be less than 10  $\mu\text{m}$ , given that the particle size is limited to 3  $\mu\text{m}$  or less, it would be reasonable to expect the size of the pores remaining in the formed coating would not be sufficiently greater

than the size of the particles being used (i.e. less than 3  $\mu\text{m}$ ) since holes large than this size would likely be filled by the particles during formation of the coating.

Regarding claim 19, as was set forth above the hardness of the coating of Harada as modified by Herbst-Dederichs has a hardness of in excess of 700 Hv. Regarding the limitation that the standard deviation for the hardness be within the claimed range, absent evidence to the contrary, the hardness of the coating is considered to be within the claimed range since the formed coating is intended to have homogenous properties.

Regarding claims 20 and 28-29, the coating of Harada as modified by Herbst-Dederichs would meet the limitation of being coated on at least the outer peripheral surface (Figure 1 of Herbst-Dederichs). Furthermore, Harada teaches that a second phase metal such as Mo, may be contained in the metal and that the first phase exists in greater amounts than the second phase material given that the Chromium carbide and Ni metal matrix comprise at least 55 wt% combined (50 % CrC + 5% Ni) and could comprise up to 100% (95-50 % CrC + 5-50% Ni respectively) (abs).

Regarding claim 21, as was set forth above the first phase containing CrC and Ni matrix comprise between at least 55 wt% to 100 wt% of the coating, which completely encompasses the claimed range of between 60% to 95% of the coating.

Regarding claims 22-25, the coating of Harada as modified by Herbst-Dederichs meets the claim limitations wherein the carbide particle size is less than 3  $\mu\text{m}$ , the average pore diameter being less than 3  $\mu\text{m}$  and the porosity is less than 1.2%.

Regarding claim 26, the references are silent to the surface roughness of the coating however given that the coating uses the same materials have the same particle sizes being deposited by the same sprayed process as what is claimed, it would be reasonable to expect that the surface roughness of the formed coating would be within the range of less than 4  $\mu\text{m}$  Rz.

Regarding claim 27, Herbst-Dederichs teaches that primary chromium carbide particles are preferred however it does teach that dendritic carbides can be formed in the coating by using conventional materials and spraying methods (par[0007]). Although Herbst-Dederichs teaches away from what it claimed, the disclosure would make it obvious to one of ordinary skill in the art at the time of the invention as to how form dendritic carbides in the coating.

Regarding claims 30 and 32, the use of an HVOF spraying method such as is taught by Herbst-Dederichs (par[0002]) would meet the limitation of rapidly solidifying a melt of the matrix metal containing the chromium carbide particles as well as meeting the limitation of claim 32 that the spraying method is an HVOF process.


Regarding claim 31, Herbst-Dederichs teaches that the composite powders comprising chromium carbide and the matrix metals are formed into agglomerated powders which are sintered

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason L. Savage whose telephone number is 571-272-1542. The examiner can normally be reached on M-F 6:30-4:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on 571-272-1535. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Jason Savage  
11-28-08

  
DEBORAH JONES  
SUPERVISORY PATENT EXAMINER